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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/527,410	12/27/2005	Ian Saunders	2004-1038	4849
466 7590 08/16/2007 YOUNG & THOMPSON 745 SOUTH 23RD STREET 2ND FLOOR ARLINGTON, VA 22202			EXAMINER HANSEN, JONATHAN M	
			ART UNIT 2886	PAPER NUMBER
			MAIL DATE 08/16/2007	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/527,410

Applicant(s)

SAUNDERS ET AL.

Examiner

Jonathan M. Hansen

Art Unit

2886

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 December 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 25-46 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 25-46 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 December 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 03/11/2005.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statement filed 03/11/2005 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 25-28, 30, 33-39, 41 and 43-46 are rejected under 35 U.S.C. 102(b) as being unpatentable by US Pat. # 5,426,503 to Kusunose.

With regard to claims 25 and 37, Kusunose discloses a method and apparatus for measuring an amount of phase shift and light transmittance by a phase shifting mask for use in photolithography, comprising:

irradiating the measuring area with a light beam, while reflection or transmission of the beam occurs (fig. 1 below, wherein light beam 11 radiates phase shift mask 1; the light transmission embodiment is shown below and the reflectance embodiment is shown in fig. 21);

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splitting the transmitted or reflected beam (fig. 1 below, wherein the half-mirror 5a splits the measurement beam);

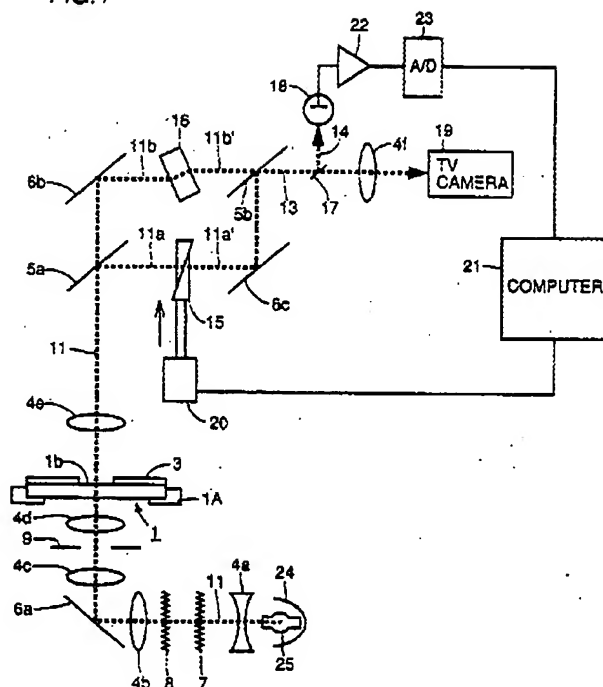
varying the phase of the split beams relative to each other, such that the differential phase is kept within the range of 2π (fig. 1 below, wherein the optical wedge 15 varies the phase of the split beam as it is moved perpendicular to the optical path; the limitation of within a range of 2π is inherent given that, due to 2π ambiguity, the measurements would begin to repeat as the phase was varied greater than 2π);

combining the split beams with each other and observing a fringe pattern which represents a differential phase between the split beams (fig. 1 below, wherein half-mirror 5b combines the split beams; and col. 12, ll. 35-40 wherein the fringe data is observed on a television screen);

calculating an optical path length difference from the differential phase (col. 12, ll. 55-60 and col. 13, 1-14); and

relating the optical path length difference to the contour variation of the object, characterized in that the phase is varied by placing, in only one of said split beams, an optical phase filter for generating a predetermined phase plane (col. 13, ll. 5-10).

FIG. 1



As to claims 26 and 38, Kusunose discloses a method and apparatus, characterized in that the phase of the split beams is varied by carrying out a relative movement of the beam and the measuring area such that the form of the measuring area changes (fig. 27, wherein the x-y stage 53 (applicant's holder) moves the pattern vertically and horizontally).

As to claims 27 and 39, Kusunose discloses a method and apparatus, characterized in that the form of the measuring area changes under the influence of a material-adding or material-removing operation (col. 6, ll. 34-39; wherein the phase shift mask is used in a photolithography apparatus and method).

As to claim 28, Kusunose discloses a method and apparatus, characterized in that the method is repeatedly used for measuring phase changes greater than 2π (As discussed above, this limitation is inherent in that any phase variation greater than 2π will produce duplicate measurements for phase variations less than 2π).

With regard to claims 30 and 41, Kusunose discloses a method and apparatus, characterized in that the beam has a diameter such that at least two positions, varying in height in a measuring area are exposed (fig. 2b below, wherein the directed beam radiates the entire phase shift mask and light transmitting portion 1b and phase shifting portion 3 vary in height); which method comprises the steps of:

shifting the measuring beam relative to itself along the connecting line between said positions so that a differential phase between the shifted beams lies within a range of 2π (wherein light will be phase shifted due to the pattern of the phase shift mask); and

calculating an optical path length difference related to the contour variations of the object (col. 13, ll. 5-10).

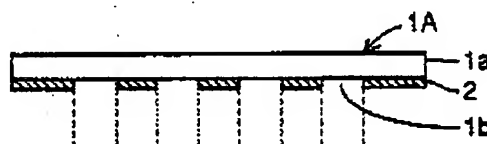
FIG.2B

With regard to claims 33 and 43, Kusunose discloses a method and apparatus, characterized in that the measuring beam is a parallel light beam of a relatively small diameter (col. 11, ll. 47-51), wherein the measuring area possesses a dimension smaller than the diameter of the measuring beam (the measurement beam radiates the entire phase shifting mask wherein the mask pattern is much smaller than the mask itself).

With regard to claims 34 and 44, Kusunose discloses a method and apparatus, characterized in that the reflected measuring beam is a diffuse light beam (the limitation of the measuring beam being diffuse is an inherent property of the apparatus. Unless the measurement area is taught to be a mirror or similar specular material the reflected beam would be diffuse).

With regard to claims 35, 36, 45 and 46, Kusunose discloses a method and apparatus, characterized in that the measuring beam is a homogenous, parallel light beam (col. 11, ll. 47-51), wherein the measuring surface is provided with a mat layer (fig. 23a below showing a typical mask structure, wherein pattern 2 is viewed as the matte layer), and the measuring beam is reflected on a smooth surface (fig. 23a below showing a typical mask structure, wherein transparent substrate 1a is made of flat glass), such that the reflected beam is a diffuse light beam.

FIG. 23(A)
PRIOR ART



Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 29, 31, 32, 40 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Kusunose** in view of **US Pat. # 5,192,982 to Lapucci**.

With regard to claims 29 and 40, Kusunose substantially discloses the claimed invention, however he differs from the limitations of claims 29 and 40 in that he does not explicitly disclose the method and apparatus, characterized in that the phase filter is a pinhole the size of the diffraction spot.

However, Lapucci teaches a Mach-Zehnder interferometer that utilizes spatial filters 11 and 15 below in order to limit the optical path difference (fig. 3 below and col. 7, ll. 4 and 8). It is noted that a pinhole is a basic spatial filter and that the hole size would need to be diffraction size in order to properly limit the path difference.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Kusunose to include a pinhole as the phase filter for the advantage that the pinhole filter is a basic and inexpensive spatial filter.

With regard to claims 31 and 42, Kusunose substantially discloses the claimed invention, however he differs from the limitations of claims 31 and 42 in that he does not explicitly disclose the method and apparatus, characterized in that the method comprises the step of displacing a split beam by means of a rotating mirror;

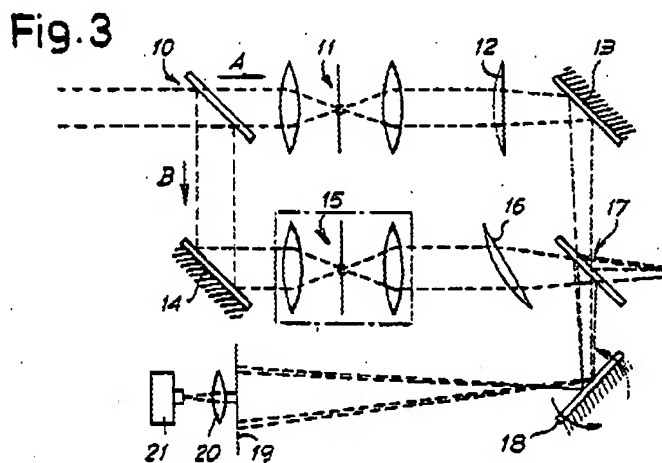
projecting the split beams on a lens, which beams, as a result of the displacement, run at an angle relative to each other; and

observing, in a focal plane of the lens, a fringe pattern resulting from a shift of the beams, which corresponds to the angular displacement of the rotating mirror.

However, Lapucci teaches the use of a rotating mirror 18 that project the measurement beam on to screen 19 and lens 20. Wherein, the interference information is collected by photodetector 21 (col. 7, ll. 19-26).

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Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Kusunose to include a rotating mirror for the advantage of being able to change how the measurement beam is incident on screen 19 and lens 20, as taught by Lapucci.



As to claim 32, Kusunose discloses a method and apparatus, characterized in that the degree of shearing is determined by the slope of the contour variation (fig. 1 above, wherein the optical shearing member 16 changes the position of the light to allow for interference).

Conclusion

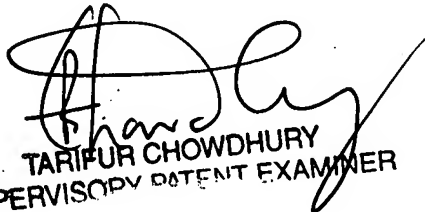
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan M. Hansen whose telephone number is 571.270.1736. The examiner can normally be reached on Monday through Friday 8:30AM to 6:00PM EST.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tarifur Chowdhury can be reached on 571.272.2287. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JMH


TARIFUR CHOWDHURY
SUPERVISOR, PATENT EXAMINER